SPECIAL NOTE FOR
QC/QA SPECIFICATIONS FOR STRUCTURAL AND NONSTRUCTURAL CONCRETE ACCEPTANCE

This Special Note will apply where indicated on the plans or in the proposal. Section references herein are to the Department's current Standard Specifications for Road and Bridge Construction.

1.0 DESCRIPTION. This Special Note specifies the process control and acceptance testing for all cast-in-place concrete, except Class P Concrete used for pavement. The Department will sample and perform acceptance tests on concrete supplied specifically for the bid item of Concrete Overlay. Perform work and furnish materials according to the Department's Standard Specifications with the following exceptions and additions. Perform both process control and acceptance testing. Minimum test frequencies are provided. The Department will only perform verification testing.

2.0 MATERIALS. Conform to Subsection 601.02. For items containing concrete as an incidental component such as curb and gutter, drop box inlets, median barrier, etc., conform to the appropriate subsections for the incidental item.

3.0 PROCESS.

3.1 Quality Control Plan (QCP). Submit a QCP to the Engineer for review and approval (see Appendix A) at least 15 calendar days before starting concrete operations. The QCP is the responsibility of the Contractor and should be a joint effort between the Contractor and any subcontractors. Submit a revised QCP for review and approval if changes are necessary.

3.2 Contractor Requirements.

1) Select a concrete production facility that conforms to the production requirements found in Subsection 601. If the facility fails to meet these requirements during production and is no longer qualified to supply concrete the Contractor is solely responsible for obtaining the services of another concrete production facility to continue placement of concrete on the project.
2) Provide concrete technicians, certified as ACI Level I Concrete Field Testing Technicians, on site to inspect all quantities of concrete delivered to the project.
3) Provide an AASHTO accredited or Kentucky Transportation Cabinet qualified laboratory facility.
4) Job Site Acceptance Requirements:

    a) Trip Tickets. Collect trip tickets for each load of concrete. Check each truck mixer for a current performance test sticker and the metal plate stating manufacturers recommended capacities and revolution speeds. Verify and/or record the following for each load of concrete delivered to the project:

        - Age of Mix
        - Mixing revolutions recorded on the trip ticket
        - Discharge Time

- Addition of Water
- Additional Mixing Revolutions if Water is added
- Job Site Test Data

The Technician shall reject concrete failing to meet the requirements for any item.

b) Technician Responsibilities. Inspect all quantities of concrete delivered to the project. Inspection responsibilities include field tests for slump, air content, temperature, and casting of cylinders of the plastic concrete. Perform all testing according to the applicable Kentucky Methods and reject concrete failing to meet the requirements of any of these tests.

5) Testing Of Concrete:

a) Start Up Test Frequencies. Perform start-up slump, air content, and temperature tests each day of placement for each class of concrete at the following minimum frequencies:

Class of Concrete	Minimum Start-up Testing Frequency
Concrete for Bridge Decks, A, A Mod., AA, AAA, & B, D, D Mod, M & S, JPCP 24/48/72	First Unit and any 1 of the next 4 Units

The First Unit is the first load delivered producing acceptable start up test results. For example; if the first load of the day produces failing test results, it is rejected. Repeat Start Up Tests for the second load delivered. If the second load produces passing test results it is accepted and considered the First Unit.

b) Acceptance Testing. Provide test equipment conforming to requirements of the appropriate test method. The Engineer may inspect and reject any equipment found defective.

Sample and test the plastic concrete for air content, slump, and temperature at the point of placement. Once the First Unit has been established, the Department will include all randomly selected samples for acceptance. If any randomly selected production unit is outside the specification limits for slump, temperature, or air content, return to the start-up testing frequency.

Mold a minimum of one set of cylinders at the point of placement for each randomly selected truck of concrete for compressive strength testing. A “set” of cylinders is outlined in KM 64-305. Randomly sample and test when the Engineer directs.

Obtain samples anytime visual inspection of the delivered concrete indicates questionable specification compliance.

Perform compressive strength testing on certified or Department approved machines. Notify the Engineer at least 24 hours prior to the time of compressive strength testing so that the test may be witnessed. The Department will witness and document a minimum of 75 percent of the tests.

Core any concrete meeting the criteria for investigation of in-

place concrete based on low cylinder strengths according to KM 64-314. When coring is required, furnish equipment and personnel necessary to obtain and test cores. Core diameter will be as required by the Department. Number cylinders for strength testing of concrete according to the following format unless otherwise approved by the Engineer:

Structure # - Date – Letter representing the sequence of units*

* The sequence of units is based on the testing frequency for that class of concrete. For example: if 150 cubic yards of class AA concrete are poured on a single day, the cylinders representing the first 50 cubic yards would be designated by the letter "A", the cylinders representing the second 50 cubic yards would be designated by the letter "B", etc. If a set of cylinders is made for early breaks, the unit identification should be replaced with an "X". The verification cylinders made by the department will use a "V" after the unit identification.

c) Sampling Frequencies for all Concrete Classes.

Concrete Class	**Frequency**
AAA, AA, D, D Mod, & S	Each 50 cubic yards or fraction thereof/class/day
A, A Mod, & B	Each 100 cubic yards or fraction thereof /class/day
JPCP 24/48/72	Each 150 cubic yards or fraction thereof /class/day
M1 & M2	Sample and test according to Subsection 601.03.03(A)(11)

Small quantities of less than 15 cubic yards per class per day may be accepted for nonstructural concrete applications without testing unless quality is in question.

d) Documentation. Record all job site test results when obtained. Provide a summary of test results and trip tickets at least weekly to the Engineer. In the summary, include a record of all concrete rejected. As 28-day breaks are obtained, submit air and strength results along with corresponding random numbers and cylinder identification. Report all failing compressive strength tests to the Engineer as soon as possible, but no later than the end of the testing day.

e) In addition to acceptance testing, perform all sampling, testing (slump, air, temperature and strength) for the purpose of either load applications, or opening to traffic. These results are to be kept separate from random QC results and are not to be used for pay.

3.3 Concrete Producer Requirements. Requirements include mix design, testing, documentation, plant approval, and truck approval in accordance with Section 601.Submit mix designs to the Engineer using either Option A or Option B below.

Option A. Kentucky Mix Design. Submit mix designs according to Subsection 601.03.02 G at least 15 calendar days before starting concrete operations. Design and proportion the concrete mixtures according to Subsection 601.03.03. Resubmit the mix designs when changes are made.

Option B. ACI-318 Mix Design. Comply with ingredient material specifications and mineral admixture limitations according to the Department's Standard Specifications. Conform to the following if requirements are not modified elsewhere by plan note.

REQUIREMENTS FOR VARIOUS CLASSES OF CONCRETE WHEN ACI-318 IS APPLIED

Concrete Class	Max. Free Water By w/c Ratio (lbs/lbs)	Min. 28-Day Comp. Strength (psi)	Air Content (%)
A	0.49	3,850	6± 2%
A Mod	0.47	3,850	6± 2%
AA	0.42	4,400	6± 2% *
AAA	0.40	6,050	6± 2% *
B	0.66	2,750	6± 2%
D	0.44	4,400	6± 2%
D Mod	0.42	5,500	6± 2%
S	0.53	4,400	6± 2%

* The air content shall be 7 ± 2% when coarse aggregate sizes #8, #78, or #9-M are used.

3.4 Department Responsibilities.

1) Concrete Mixture Verification Testing. The Engineer will conduct verification testing to verify acceptance procedures. Only ACI Level I qualified personnel will perform the verification testing. The Engineer will determine according to KM 64-113 when the Contractor is to perform random sampling and testing. The Engineer will notify the Contractor immediately before required random sampling and testing.

The Engineer will test at a minimum frequency of one per every 8 acceptance tests. The Engineer reserves the right to increase the frequency of testing when deemed necessary. The Engineer will perform verification testing on independent samples from the same batch and location as the Contractor's sample and promptly compare results. Additionally, the Engineer may select any portion of any concrete at any time to verify specification limits. All verification cylinders will be the same size as the acceptance cylinders.

When the verification test results differ from the Contractor's test results by more than tolerances shown below, the discrepancy must be resolved and documented along with the verification results. The dispute resolution outlined in Section 113 will be utilized to verify the acceptability of the concrete.

The Department will witness and document a minimum of 75 percent of the tests.

Acceptance/Verification Tolerance*

Test	Tolerance
Air Content	± 0.75%
Compressive Strength	± 15%
Temperature	± 3 °F
Slump	± 25% of maximum limit

*These tolerances only apply to verification samples

2) Core Strength Evaluation for all Classes of Concrete. When investigation is required, the Engineer will direct the Contractor in obtaining cores and take possession of the cores for testing. The Engineer will evaluate cores according to KM 64-314. Class M will be evaluated according to 601.05.

4.0 MEASUREMENT.

4.1 All Concrete Classes and Items. The Department will measure JPCP 24/48/72, Class M and all other pay items containing concrete, such as Curb and Gutter, Drop Box Inlets, Barrier Median and concrete incidental to other pay items according to the appropriate subsections.

4.2 Measurement of Dispute Items. Dispute items may require a third party resolution by a mutually agreeable laboratory. If the independent laboratory testing and investigation indicates that the Department's tests are correct, pay the cost of the investigation. If the independent laboratory testing and investigation indicates that the Department's tests are not correct, the Department will pay the cost of the investigation.

When the dispute is resolved at any level, and the Department's verification tests are correct, the Department will base the Contractor's pay on the Department's verification test results rather than on the Contractor's acceptance test results. When the Department's verification tests are not correct, the Department will base the Contractor's pay on the Contractor's acceptance test results as the appropriate section or subsection specifies.

4.3 Measurement of Quality Control (QC). The Department will measure the quantity by the lump sum. The Department will not measure the QCP, any actions and personnel required to carry out the QCP, any testing, any testing equipment, or any other work necessary to perform the specified QC/QA procedures and will consider them incidental to this item of work.

5.0 PAYMENT. The Department will base pay estimates for concrete quantities on contract unit prices for each individual class of concrete according to the appropriate section.

Code	Pay Item	Pay Unit
----	Concrete, Class	See Subsection 601.05
----	JPCP 24/48/72, Class M and Other Concrete Items [(1)]	See Appropriate Subsection
----	Dispute Resolution	See Appropriate Subsection
----	QC	Lump Sum

[(1)] Includes items containing concrete such as Curb and Gutter, Drop Box Inlets, Barrier Median, and concrete incidental to other pay items.